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WHAT IS CLAIMED IS:

1. An optical imaging system comprising:

a rod lens array comprising a plurality of rod lenses having a refractive index distribution in a radial direction that are arranged in two rows with their optical axes in parallel, and

a manuscript plane and an image plane that are located on opposite sides of the rod lens array,

wherein the refractive index distribution of the rod lenses is 10 expressed by

$$Eq. 1 \quad \mathbf{n}(\mathbf{r})^2 = \mathbf{n}_0^2 \cdot \{1 - (\mathbf{g} \cdot \mathbf{r})^2 + \mathbf{h}_4 \cdot (\mathbf{g} \cdot \mathbf{r})^4 + \mathbf{h}_6 \cdot (\mathbf{g} \cdot \mathbf{r})^6 + \mathbf{h}_8 \cdot (\mathbf{g} \cdot \mathbf{r})^8\}$$

where r is a radial distance from an optical axis of the rod lenses, n₀ is a refractive index on the optical axis of the rod lenses, and g, h₄, h₆ and h₈ are refractive index distribution coefficients,

the refractive index distribution coefficients h_4 , h_6 and h_8 are on a spheroid in a Cartesian coordinate system with h_4 being x-axis, h_6 being y-axis and h_8 being z-axis, and

the spheroid is defined by a vector X* that is expressed by

Eq. 2
$$X^* = (x, y, z) = O^* + k_A A^* + k_B B^* + k_C C^*$$

where O* is a vector from an origin of the Cartesian coordinate system to a center of the spheroid, A*, B* and C* are vectors in the directions of a major axis, a mean axis and a minor axis of the spheroid, respectively, and k_A , k_B and k_C satisfy $k_A^2 + k_B^2 + k_C^2 \le 1$.

2. The optical imaging system according to claim 1, wherein k_A , k_B and 30 k_C satisfy

Eq. 3
$$k_A^2 + k_B^2 + k_C^2 \le 0.7$$
.

3. The optical imaging system according to claim 1, wherein the refractive index n_0 on the optical axis of the rod lenses is in a range of $1.4 \le n_0 \le 1.8$.

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- 4. The optical imaging system according to claim 1, wherein a product $g \cdot r_0$ of the refractive index distribution coefficient g and a radius r_0 of a portion of each rod lens functioning as a lens is in a range of $0.04 \le g \cdot r_0 \le 0.27$.
- 5. The optical imaging system according to claim 1, wherein the refractive index distribution of the rod lenses is expressed by

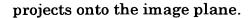
Eq. 4
$$\mathbf{n}(\mathbf{r})^2 = \mathbf{n}_0^2 \cdot \{1 - (\mathbf{g} \cdot \mathbf{r})^2 + \mathbf{f}(\mathbf{r})\}$$

where f(r) is a function of r, and the f(r) satisfies

$$\begin{aligned} Eq. \ 5 \quad & \ h_{4A} \cdot (\mathbf{g} \cdot \mathbf{r})^4 + h_{6A} \cdot (\mathbf{g} \cdot \mathbf{r})^6 + h_{8A} \cdot (\mathbf{g} \cdot \mathbf{r})^8 \leq f(\mathbf{r}) \leq h_{4B} \cdot (\mathbf{g} \cdot \mathbf{r})^4 \\ & + h_{6B} \cdot (\mathbf{g} \cdot \mathbf{r})^6 + h_{8B} \cdot (\mathbf{g} \cdot \mathbf{r})^8 \end{aligned}$$

for r in a range of $0 \le r \le r_0$ (r_0 : a radius of a portion of each rod lens functioning as a lens) with respect to two groups of refractive index distribution coefficients (n_0 , g, h_{4A} , h_{6A} , h_{8A}) and (n_0 , g, h_{4B} , h_{6B} , h_{8B}) that are in the ranges determined by Equation 2.

- 6. The optical imaging system according to claim 1, wherein a radius r_0 of a portion of each rod lens functioning as a lens is in a range of 0.05 mm \leq $r_0 \leq$ 0.60 mm.
- 7. The optical imaging system according to claim 1, wherein r_0/R is in a range of $0.5 \le r_0/R \le 1.0$, where r_0 is a radius of a portion of each rod lens functioning as a lens and 2R is a distance between the optical axes of two neighboring rod lenses.
- 30 8. The optical imaging system according to claim 1, wherein Z_0/P is in a range of $0.5 \le Z_0/P \le 1.0$, where Z_0 is a length of the rod lenses and $P = 2\pi/g$ is a one-pitch length of the rod lenses.
- 9. The optical imaging system according to claim 1, wherein an
 35 overlapping degree m is in a range of 0.9 ≤ m ≤ 5.0, and the over lapping degree m is given by m = X₀/2r₀, where r₀ is a radius of a portion of each rod lens functioning as a lens and X₀ is an image radius that the rod lens



- 10. The optical imaging system according to claim 1, wherein a parallel plane transparent substrate is arranged so that the manuscript plane is located at a front focal position of the rod lens array.
- 11. The optical imaging system according to claim 10, wherein the parallel plane transparent substrate is in contact with a lens surface of the rod lens array.

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